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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Chung-Fan CHIOU et al.

Serial No.: 10/021,706 Art Unit: 1743

Filed: November 5, 2001 Examiner: TBA

For: METHOD AND APPARATUS FOR MANUFACTURING BIOCHIP

MARKUP ACCOMPANYING PRELIMINARY AMENDMENT

Hon. Commissioner of
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Washington, DC 20231

Sir:

IN THE SPECIFICATION

Pursuant to 37 C.F.R. §1.121(b)(1)(iii), please amend the specification as follows.

Page 3, line 28, to page 4, line 10:

Accordingly, the invention provides an apparatus for manufacturing a biochip from a substrate. The apparatus comprises a conveying device and a series of dispensers positioned at a series of dispensing positions above the conveying device. At least one substrate is disposed on the conveying device, and the conveying device successively moves each substrate below the series of dispensers. Each of the dispensers has a plurality of nozzles facing the substrate. Each of the nozzles dispenses a predetermined reagent at a predetermined position of the substrate; thereby, [an array] a plurality of reagents is dispensed on the substrate at each dispensing position. The successive movement of the substrate below the series of dispensers obtains a biochip with a high-density array of reagents disposed thereupon.

Page 4, lines 11-19:

In a first preferred embodiment, the conveying device moves the substrates linearly along a first axis. The dispensers are positioned above the conveying device and separated by a predetermined distance. The conveying device moves each substrate the predetermined distance along the first axis in a step-by-step manner such that the substrate is positioned in turn below each dispenser during the fabrication of the biochip. When the substrate is positioned below each dispenser, [an array] a plurality of reagents is dispensed thereupon.

Page 4, line 20, to page 5, line 5:

In a second preferred embodiment, the conveying device moves the substrates linearly along a first axis. The dispensers are divided into a plurality groups positioned above the

conveying device and separated by a predetermined distance. Each group comprises a plurality of dispensers linearly disposed along a second axis perpendicular to the first axis. The conveying device moves each substrate the predetermined distance along the first axis in a step-by-step manner such that the substrate is positioned in turn below each group of dispensers during the fabrication of the biochip. When the substrate is positioned below each group dispensers, a driving device moves the group of dispensers along the second axis in a step-by-step manner such that each dispenser of each group is positioned in turn above the substrate during the fabrication of the biochip. When the substrate is positioned below each dispenser, [an array] a plurality of reagents is dispensed thereupon.

Page 5, lines 6-15:

In a third preferred embodiment, the conveying device rotates the substrates through a circular path. The dispensers are positioned in a ring above the conveying device and separated by a predetermined distance. The conveying device rotates each substrate such that it travels an arc covering the predetermined distance in a step-by-step manner so that the substrate is positioned in turn below each dispenser during the fabrication of the biochip. When the substrate is positioned below each dispenser, [an array] a plurality of reagents is dispensed thereupon.

Page 7, lines 11-29:

The dispensers 420 are disposed above the conveying device 410 and separated at a predetermined distance G along the axis X. The conveying device 410 moves the substrate 430 the distance G in a step-by-step manner such that the substrate 430 is successively positioned below each dispenser 420. The dispensers 420 comprise a plurality of nozzles 421, as shown in Fig. 3c, facing

the substrate 430 disposed on the base 411. Each of the nozzles 421 can dispense a predetermined reagent on a predetermined position of the substrate 430; therefore, one dispenser 420 dispenses [an array] a plurality of reagents at different positions on the substrate 430. It is noted that the [arrays] plurality of reagents dispensed on the substrate 430 by different dispensers 420 in the series are preferably aligned such that the reagents do not overlap, as illustrated in Figs. 4A to 4D. In Fig. 4A, an array of reagents dispensed by the first dispenser is labeled 1. In Figs. 4B to 4C, successive arrays dispensed by the second and third are labeled successively 2 and 3. Fig. 4D illustrates an embodiment of a completed biochip after receiving [an array] a plurality of reagents from nine dispensers.

Page 7, line 30 to page 8, line 6:

A plurality of substrates 430 can be received in turn and supported on the base 411 of the conveying device 410 at the same time. The conveying device 410 simultaneously moves each of the substrates 430 supported on the base 411 the distance G in a step-by-step manner such that each substrate is moved successively below each dispenser 420. At each stop below a dispenser 420, [an array] a plurality of reagents is dispensed onto the substrate 430.

Page 9, lines 26-31:

When the substrate 530 is positioned below a group of dispensers 521, the driving device 570 moves the group of dispensers 521 along the second axis Y in a step-by-step manner such that each dispenser is positioned in turn above the substrate 530. When a dispenser 520 is positioned above the substrate 530, [an array] a plurality of reagents is dispensed thereupon.

Page 10, lines 1-8:

A plurality of substrates 530 can be received in turn and supported on the conveying device 510 at the same time. The conveying device 510 simultaneously moves each of the substrates 530 the distance G in a step-by-step manner such that each substrate is moved successively below each group of dispensers 521. At each stop below a group of dispensers 521, each dispenser 520 in the group of dispensers 521 dispenses [an array] a plurality of reagents onto the substrate 530.

Page 10, line 25 to page 11, line 7:

The conveying device 610 comprises a rotor 611 and a platform 612. The rotor 611 is electrically connected to the step motor 660 so that it can rotate the platform 612 by the actuation of the step motor 660. The platform 612, disposed around the rotor 611, is used for receiving and supporting substrates 630. The platform 612 is circular shape, and the dispensers 620 are disposed in a ring and separated by a predetermined distance G. The conveying device 610 rotates each substrate 630 such that it travels an arc covering the predetermined distance G in a step-by-step manner so that the substrate is positioned in turn below each dispenser 620 during the fabrication of the biochip. When the substrate 630 is positioned below each dispenser 620, [an array] a plurality of reagents is dispensed thereupon.

Page 11, lines 8-17:

A plurality of substrates 630 can be received in turn and supported on the conveying device 610 at the same time. The conveying device 610 simultaneously moves each of the substrates 630

the distance G in a step-by-step manner such that each substrate is moved successively below each dispenser 620. At each stop below a dispenser 620, [an array] a plurality of reagents is dispensed onto the substrate 630. Since multiple substrates can be processed at the same time, the biochips can be mass-produced. As a result, the efficiency of manufacturing the biochips is significantly increased.

Page 11, line 28 to page 12, line 17:

The conveying device 710 comprises a base 711, a plurality of transferring devices 712, a plurality of positioning devices 713, a plurality of retainers 714 and a plurality of fixtures 715. The base 711, provided with a slot 7111, is used for the fixtures 715 disposing thereupon. Each of the transferring devices 712 corresponds to a dispenser 720 and comprises a cam 7121 and a rod 7122. Each of the cams 7121 is rotatablly disposed at the base 711. Each of the rods 7122 is connected to a cam 7121 at one end and abuts the fixture 715 through the slot 7111 at the other end. The rod 7122 moves a fixture 715 by the rotation of the cam 7121 from a position below the corresponding dispenser 720 to a position below an adjacent dispenser along the axis X. The positioning devices 713, corresponding to a dispenser 720, are disposed at the base 711 and used for pushing the fixture 715 into a predetermined position on base 711. Three retainers 714, disposed on the base 711, cooperate with a corresponding positioning device 713 by abutting the [fixture] substrate 730 to locate the fixture 715 at the predetermined position on the base 711. Each of the fixtures 715, disposed on the base 711, is used for receiving and supporting the substrate 730.

Page 12, line 18 to page 13, line 1:

The dispensers 720 are disposed above the conveying device 710 and separated at a predetermined distance G along the axis X. The conveying device 710 moves the fixture 715 the distance G in a step-by-step manner such that the substrate 730, disposed on the fixture 715, is successively positioned below each dispenser 720. The dispensers 720 comprise a plurality of nozzles (not shown), same with the first embodiment, facing the substrate 730 disposed on the fixture 715. Each of the nozzles can dispense a predetermined reagent on a predetermined position of the substrate 730; therefore, one dispenser 720 dispenses [an array] a plurality of reagents at different positions on the substrate 730. It is noted that the [arrays of] reagents dispensed on the substrate 730 by different dispensers 720 in the series are preferably aligned such that the reagents do not overlap.

Page 13, lines 2-9:

A plurality of substrates 730 can be received in turn and supported on the different [fixtures] bases 711 of the conveying device 710 at the same time. The conveying device 710 simultaneously moves each of the substrates 730 supported on the fixtures 715 the distance G in a step-by-step manner such that each substrate is moved successively below each dispenser 720. At each stop below a dispenser 720, [an array] a plurality of reagents is dispensed onto the substrate 730.

IN THE CLAIMS

Pursuant to 37 C.F.R. §1.121(c)(1)(ii), please amend the claims as follows.

1. (Amended) An apparatus for manufacturing at least one biochip from at least one substrate comprising:

a conveying device for moving the substrate through a series of receiving positions; and

a series of dispensers positioned at a series of dispensing positions relative to the series of receiving positions of the conveying device, wherein each of the dispensers has a plurality of nozzles, and each of the nozzles dispenses a predetermined reagent at a predetermined position of the substrate;

wherein each dispenser in the series of dispensers dispenses [an array] a plurality of reagents onto the substrate when the substrate is positioned in the corresponding receiving position.

15. (Amended) A method for manufacturing at least one biochip from at least one substrate comprising the steps of:

receiving the substrate on a conveying device;

conveying the substrate through a series of receiving positions corresponding to a series of dispensing positions; and

dispensing a series [of arrays] of reagents onto the substrate at each dispensing position.

18. (Amended) The method as claimed in claim 15, wherein the series of [arrays] reagents is non-overlapping.

20. (Amended) A method for manufacturing at least one biochip from at least one

substrate comprising the steps of:

receiving the substrate on a conveying device;

conveying the substrate through a series of receiving positions corresponding to a series of forming positions; and

forming a series of [arrays of] reagents onto the substrate at each forming position.

23. (Amended) The method as claimed in claim 20, wherein the series of [arrays] reagents is non-overlapping.

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Abstract of the Disclosure

The invention provides an apparatus for manufacturing a biochip from a substrate. The apparatus comprises a conveying device and a series of dispensers positioned at a series of dispensing positions above the conveying device. At least one substrate is disposed on the conveying device, and the conveying device successively moves each substrate below the series of dispensers. Each of the dispensers has a plurality of nozzles facing the substrate. Each of the nozzles dispenses a predetermined reagent at a predetermined position of the substrate; thereby, a plurality of reagents is dispensed on the substrate at each dispensing position. The successive movement of the substrate below the series of dispensers obtains a biochip with a high-density array of reagents disposed thereupon.